

Steam Generator Action Plan (SGAP)



**Commission Meeting
December 3, 2001
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Louise Lund, NRR
Joseph Muscara, RES**

Historical Overview

- **2/15/00 – IP2 Tube Failure Event**
- **8/29/00 – OIG Report on IP2**
- **10/23/00 – IP2LLTG Report**
- **11/16/00 – SGAP revised**
- **2/01/01 – ACRS report on SGDPO**
- **5/11/01 – SGAP Revised (DPO issues)**

SG Action Plan - Scope

- **Consolidated Action Plan**
- **NRC efforts result in an integrated regulatory framework**
- **Anticipated future revisions**

SG Action Plan- Purpose

Manage NRC efforts to ensure:

- **Milestones are appropriately tracked and dispositioned**
- **Resolution coordinated with stakeholders**
- **Document completion of significant milestones**

SGAP Main Elements

- **Modifications/Revisions to the Regulatory Process**
- **Revised Regulatory Framework
-NEI 97-06**
- **Response to ACRS
Recommendations on SG DPO**

SG Action Plan - Status

Regulatory Process:

- **20 of 23 milestones complete**
- **Open items scheduled for completion by 2/02**
- **Issues well understood and activities well underway**

NEI 97-06 Steam Generator Generic License Change Package

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Office of Nuclear Reactor Regulation

Current NRC SG Regulatory Framework

- **10 CFR Part 50, App. A and B**
- **10 CFR Part 100 Guidelines values**
- **ASME Code, Sections III and XI**
- **Plant Technical Specifications**
- **Reactor Oversight Process**

NRC SG Regulatory Framework

- **Rulemaking - 1994 to 1996**
- **Generic Letter - 1997 to 1998**
- **Consideration of industry's NEI 97-06 initiative - 1998 to present**
- **Review of NEI SG Generic License Change Package (GLCP) - 1/01 to present**

NEI 97-06

- **Generic license change package**
- **Formalizes revised framework through revised TSs**

NEI 97-06

- **Industry SG program initiative**
- **Currently implemented in conjunction with existing technical specifications (TSs)**
- **High level guidance for utility SG programs**
- **Detailed guidance in EPRI guidelines referenced in NEI 97-06**

NEI 97-06

- **Program incorporates a balance of:**
 - **prevention**
 - **inspection**
 - **evaluation**
 - **repair**
 - **maintenance**
 - **leakage monitoring**

NEI 97-06

- **Establishes performance criteria that define the basis for SG operability**

Revised Framework – NEI 97-06

- **Will rely on NEI SG Generic License Change Package (GLCP)**
- **Utilities to submit revised TSs based on NRC-approved GLCP**
- **GLCP to contain a commitment to follow NEI 97-06**
- **NEI 97-06 program guidelines translated into plant procedures**

Revised Framework – NEI 97-06

- **Revised TSs and bases**
 - **Revised Spec for operational leakage**
 - **New Spec: “Steam Generator Tube Integrity”**
 - **New Administrative TS: “Steam Generator Program”**

Revised Framework – NEI 97-06

- **Technical issues will still need to be resolved**
- **Issues exist under current framework, and will continue to be addressed under revised framework**

Review Status

- **Industry requests inspection intervals beyond current requirements**
- **Staff believes that approach must ensure that:**
 - **Tube integrity performance criteria will continue to be met**
 - **Tubing conditions not meeting the performance criteria will be promptly detected**

Review Status

- **Staff concluded that regulatory controls were needed**
- **Incorporate provision in Administrative TS regarding use of NRC-approved inspection intervals**

Review Status

- **Near Term Actions:**
 - **Staff to review anticipated package from industry defining generic inspection intervals**
 - **Recent meeting with NEI on final GLCP**
 - **Schedule for staff safety evaluation**

Review Status

- **Long Term Action:**
 - **Resolve outstanding issues with EPRI guideline documents to permit use of intended performance based approach and removal of prescriptive inspection interval requirements.**

Research on Steam Generator Action Plan DPO Issues

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Office of Nuclear Regulatory
Research**

Research Activities

- **Current issues and anticipatory research**
- **Confirm effectiveness of current regulations or recommend improvements**

Research Activities

- **Materials behavior and structural integrity**
- **Accident analysis - thermal hydraulics**
- **Improved risk methods**
- **80% of DPO milestones addressed by RES**

Crack Propagation Under Main Steam Line Break (MSLB) Loads

- **Estimate loads, crack growth, and margins 12/31/02**
- **Conduct tests to validate the analytical results 06/30/03**

Jet Cutting

- **Complete tests of jet impingement under MSLB and severe accident conditions, draft reports 12/31/01**
 - **Erosion rates are 2-5 mil/hr for severe accident conditions**
 - **5% to 25% wall loss after 2 hours under MSLB conditions**
- **Jet cutting not a concern**

Tube Conditions During Severe Accidents

- **Computational Fluid Dynamics (CFD) analysis of the hot leg & steam generator to determine Tmax in tubes**
 - **Benchmarked against data 8/01**
 - **Full-scale CFD model under development 3/02**

Constant Probability of Detection (POD)

- **Complete analysis and document results 12/31/01**
 - **POD curves developed as a function of flaw parameters**
 - **Topical report was peer reviewed and is in publication**

Stress Corrosion Cracking

- **Long term understanding of mechanisms**
- **Evaluate crack initiation, evolution and growth 12/31/05**
 - **Realistic loads & environments**
 - **Alloys 600 and 690**
- **Develop models to predict cracking of tubes 12/31/06**

Conclusions

- **Some research completed to resolve DPO issues-Jet Impingement, POD**
- **Research to address most DPO issues by 2003**

Conclusions (continued)

- **Long-term research on degradation mechanisms will continue through 2006**
- **RES & NRR working closely to implement research in resolution of issues**

Acronyms

- **ACRS – Advisory Committee on Reactor Safeguards**
- **DPO – Differing Professional Opinion**
- **IP2 – Indian Point 2**
- **LL – Lessons Learned**

Acronyms (Cont'd)

- **LLTG – Lessons Learned Task Group**
- **NEI – Nuclear Energy Institute**
- **NRC – Nuclear Regulatory Commission**
- **NRR – Office of Nuclear Reactor Regulation**

Acronyms (Cont'd)

- **OIG – Office of the Inspector General**
- **RES – Office of Research**
- **SG – Steam Generator**
- **SGAP – Steam Generator Action Plan**